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AN EXPLORATORY STUDY OF OPPORTUNITIES FOR IMPROVING SOLID WASTE COLLECTION IN OUTDOOR RECREATION AREAS OF THE TONTO NATIONAL FOREST IN ARIZONA

by

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AN EXPLORATORY STUDY OF OPPORTUNITIES FOR IMPROVING SOLID WASTE COLLECTION IN OUTDOOR RECREATION AREAS OF THE TONTO NATIONAL FOREST IN ARIZONA

As our society becomes more urbanized and industrialized, the multiple benefits of outdoor recreation to public health, both physical and mental, increase in importance. Americans are beginning to appreciate these vital roles of recreation and, and also that maltreatment threatens to weaken this very valuable resource. Concern for preserving our parklands has grown to significant levels. Clearly, there is widespread public sentiment in support of policies designed to protect our natural environment.[1]

However, before effective methods for the overall protection of natural environments can be formulated, research is needed on specific forces which act upon the environment. The mismanagement of visitor-related waste is known to be a major detriment to the perpetuation of natural areas. The vastly increased utilization of our natural areas for recreational purpose requires that immediate attention be given to the related problems caused by such expanded use before expensive and, perhaps, irreparable damage occurs. Desperately, we need to know more about the changing impact of visitor-related waste and, additionally, we need to devise means of controlling these wastes to prevent the continued deterioration of our outdoor recreational resources.[2]

As we gather data which enables us to evaluate critically our present policies and procedures, we are in an improved position to modify our recreational management practices to meet changing conditions more effectively. Minus this basic research, optimum management cannot be a realistic expectation. Furthermore, if we fail to rationalize the management of our recrea-

tional areas, we should expect the negative effects of increased utilization to accelerate their current deterioration.

Objectives

This study has two broad objectives: (1) to examine and evaluate the solid waste collection system in the Tonto National Forest and (2) to recommend measures for improvement of this system. Within this framework, special attention will be given to measurement of uncollected solid wastes at camping and picnicking sites and analysis of these data. The latter will be accomplished largely via spatial analysis, plus an examination of the degree to which the guidelines recommended by the Environmental Protection Agency for solid waste collection are being employed.

It is postulated that if significant amounts of uncollected solid waste are discovered, then the system of collection can benefit from modification. It is postulated further that detailed knowledge of the location and type of visitor sites which are well maintained and those poorly maintained will provide valuable bases for the formulation of improved collection procedures in recreational areas similar to the Tonto Forest throughout the United States.

Procedures

Extensive information on the methods employed to collect solid waste in the Tonto National Forest is not available in published form. The same is true for data on amounts of uncollected solid wastes at individual camping and picnicking areas.[3] Consequently, field researchers were required to visit the seven ranger district offices and the ninety-three study sites to gather data first hand. District rangers, or their designates, were interviewed concerning their collection practices, schedules, equipment, crews, and problems.

After discovering no accepted or standard measurement for determining site cleanliness, the following method was devised. The number of pieces of uncollected waste were counted within a ten foot radius of each trash receptacle and each picnic table. In addition, where the site had a clearly recognizable perimeter, a similar count was conducted at each north, south, east, and west boundary. If no meaningful perimeter could be identified within the site, a "typical" ten foot radius was located for measurement. This tabulating procedure was followed for all ninety-three visitor sites between June 5 and July 14, 1972.[4]

From these tedious tallies of uncollected solid waste, it was possible to establish an average figure for the number of pieces around (1) tables, (2) trash receptacles, (3) the perimeter, or (4) a typical location for each visitor area. After gaining knowledge of collection crew pick-up schedules and their actual collection practices (i.e., what types of trash they collect and which items they leave behind), it was possible to identify waste which was present simply because a collection was iminent, and waste which would remain even after subsequent pick-ups. Consequently, the recorded data reflects uncollected or "hard core" wastes, not receptacle overflow or other scattered trash merely awaiting a regular collection.

The sites studied are designated by the U. S. Forest Service as either (1) camping, (2) camping and picnicking, or (3) picnicking. Among the ninety-three examined are great differences in size, function, and accessibility.[5] In order to assess the wide spectrum of recreational development charateristic of major visitor areas, virtually all such sites in the Tonto National Forest were included in the study.

Solid Waste Collection Practices

The seven ranger districts of the Tonto National Forest have primary administrative responsibility for collecting and disposing of visitor-oriented solid waste generated within the confines of their respective districts. Each district has prepared a collection "plan." If a private refuse collector is contracted for some of the collection duties (e.g., Mesa and Payson Districts), the plan may outline specifics such as (1) identification of exact visitor areas of responsibility (including the establishment of a five foot radius around each table and trash receptacle for special attention), (2) means of collection (e.g., raking around designated tables and receptacles) and (3) weekly schedules for picking-up at the individual sites. Where Forest Service personnel are utilized, the plan normally is limited to specifying which days of the week each area is scheduled for collection.

A typical visit by a collection crew, be they contracted or Forest Service personnel, consists of emptying the trash receptacles and gathering the larger pieces of loose trash within the immediate vicinity of tables and trash containers. However, the bulk of the collection crew's time spent at the visitor site customarily is devoted to emptying cans and replacing plastic liners.[6] Most sites are picked-up before and after the weekend. A few of the most intensively used sites (e.g., Butcher Jones, Saguaro Del Norte, Acacia) are provided additional weekend service.

Significantly, collection crews are not instructed to gather tiny pieces of litter strewn outside of installed receptacles. Provision for such debris is relegated to unscheduled pick-up campaigns in the off-season or by volunteer public service groups.

Amounts of Uncollected Solid Waste

The location of the ninety-three study sties is illustrated in Figure I. The mean number of pieces of uncollected trash for each (1) receptacle, (2) collection site (commonly two or more cans were clustered at each collection location, (3) table, (4) north, south, east and west perimeter, and (5) "typical" location, for each visitor area, is shown in Table I. These average tallies indicate that amounts of uncollected trash vary tremendously among the ninety-three locations measured. For example, the highest average per collection site (160.6 pieces at Horseshoe Lake fishing area in Cave Creek Ranger District) is 42.2 times greater than the average for the cleanest site (3.8 pieces at Pioneer Pass in Globe Ranger District).

Of considerable significance, but not shown in Table I is the nature of the items which were not picked up. In almost all instances they were very small items such as pull-tabs from beverage cans, cigarette filters, plastic bag ties, scraps of paper and aluminum foil, bottle caps, etc.

While instances of overflowing receptacles were recorded, they were not common. These examples appeared to be the result of large deposits of trash left recently by weekend campers.[7] Frequently, this type of trash was enclosed in a large plastic bag by the depositor and placed alongside the Forest Service cans.

Some visitor areas are well-developed with tables, rest rooms, trash cans, etc., whereas others are merely "throwndown" camping and picnicking areas with no established facilities whatsoever. Obviously, a count of uncollected trash within a ten foot radius of cans, tables and perimeter was possible only where they had been installed. As many counts were taken as facilities were present. Where a site was undeveloped to the extent that even its perimeter could not be delimited meaningfully, then one of the more typical areas (still using a ten foot radius circle) was designated within the site and tallied. Differences in number of

categories tallied in Table I simply reflect the type of facility developed by the Forest Service.

In order to compare the diverse types of study areas more meaningfully, the raw average counts of Table I have been ranked from highest to lowest and divided into quartiles (see Table II). In the last column the mean of the quartile rankings is calculated. This final average of all available measurements of uncollected solid waste provides a single indicator or litter index for each visitor area. This litter index establishes an overall scale for the comparative measurement and analysis of uncollected solid waste throughout Tonto National Forest recreational areas.

Only by employing a litter index that incorporates measurements from several different types of visitor sites (ranging from essentially zero facilities to fully developed sites) is it possible to study large recreational areas with multiple functions. This feature of the litter index renders it a technique with wide applicability for measuring and analyzing litter in major recreational areas.

In Figure II the litter index for each visitor site has been grouped into quartiles, thereby indicating the location of visitor areas which are the cleanest and ones that are the least clean throughout the Tonto National Forest. The detailed tallies of each trash receptacle, table, etc. are all condensed into the four symbols used in this illustration. Analysis of the spatial pattern of litter shown in Figure II will be the primary means of understanding and evaluating the solid waste collection system employed in the Tonto National Forest.

Table III presents additional descriptive data gathered on the ninety-three study areas. These data will be utilized in subsequent analysis.

Spatial Analysis of the Uncollected Solid Waste Pattern

This section focuses upon the identification and examination of phenomena which interact spatially with the data illustrated in Figure II. By grouping the

visitor sites according to their accessibility from Phoenix, the principal nearby population concentration and source of visitors, it becomes apparent that those sites with the highest litter indexes are concentrated closest to this major metropolitan center. The mean of litter indexes for the three time zones in Figure III indicates an impressive decline from a high of 3.09 in zone I to 2.52 in zone II to 1.56 in the least-accessible zone III.

The total number of visitor days for each time zone shown in Figure IV reinforces the importance of access to Phoenix. While complete data is unavailable on the origin of Tonto National Forest visitors, Figure IV suggests strongly that Phoenix is the primary supplier. More important, the apparent close association between a high litter index and large numbers of visitors indicates that it is at these same sites which service large numbers of campers and picnickers that the greatest amounts of waste remains uncollected.

When visitor sites are ranked (from largest to smallest) and grouped into quartiles according to number of visitor days, the correlation between high litter index and large number of visitors is in evidence again. Conversely, it can be concluded from Table IV that those visitor sites with the least number of visitors experience the least amount of uncollected waste.

Table IV

Visitor Days and Litter Index

Visitor Days	Litter Index
Quartile I	2.85*
" II	2.79
" III	2.37
" IV	2.11

*This figure represents the Mean Litter Index for each Visitor Day Quartile

This apparent interrelationship between high litter index and large numbers of visitors is born out further by an examination of mean litter indexes in individual ranger districts (see Figure V). The ranger district having the highest average (Mesa 3.13) also has the greatest number of visitors; while the lowest litter index average is found in the Pleasant Valley District (1.56) which has the lowest attendance figure (see Figure VI). Once again, a positive correlation exists between high litter index and high attendance.

An examination of litter index in relation to function or type of visitor site provides another means of explaining the spatial pattern of litter presented in Figure II. Figure VII indicates which visitor sites have facilities for water activities such as swimming, boating and fishing. Table V shows that the water-oriented sites have a litter index average somewhat higher (2.78) than non-water locations (2.20). The significance of such a difference is unclear. It is noteworthy that water-oriented sites have a far higher average number of visitors (14,485) than do the nonwater-oriented sites (6,919).

Table V

Water Orientation and Litter Index

	Mean Litter Index	Mean Visitor Days per Site
For all 93 sites	2.51	11,870
For 61 water sites	2.78	14,485
For 32 non-water sites	2.20	6,919

A different breakdown of visitor site types is given in Table VI. These data indicate that picnic sites have a much higher mean litter index than the other three categories. Visitor day figures indicate that these same littered picnicking

sites (Type C) have the highest daily attendance. The combination of picnicking and high visitor total yields a correspondingly high litter index.[8]

Table VI

Visitor Area Type and Litter Index

Site Type	Mean Litter Index	Number of Sites	Mean Visitor Days per Site
A*	2.53	14	4,823.5
B	2.50	46	11,549.4
C	3.46	7	19,439.3
D	2.24	22	13,787.0
All 93	2.51	93	11,870.1

*For a description of site types, see footnote #3 in Table III.

Two ranger districts, Mesa and Payson, utilize privately contracted refuse collectors for some of their collections. While those sites cleaned by private sources have a higher litter index (3.06 vs 2.51), this higher figure must be understood in terms of the far larger number of visitors served by the contracted sites (see Table VII). Furthermore, it is Forest Service policy to contract outside help only for the larger, more difficult sites. Consequently, the lower average areas maintained by Forest Service collection crews does not warrant a conclusion that their efforts provide superior collection service. Simply, their tasks are not of equal difficulty. This finding agrees with studies made by the Environmental Protection Agency.[9]

Table VII

Type of Collection and Litter Index

Mean Litter Index per Sites		Mean Visitor Days per Site
For all 93	2.51	11,870.1
Contracted	3.06 (15 sites)	16,999.4
F.S.Collected	2.41 (78 sites)	10,704.4

For some other areas that are difficult to collect, the Forest Service has elected to initiate a practice of "pack-out-your-own-trash." Table VIII shows that these types of sites have a litter index average higher (3.12) than any other arrangement. According to testimony of the Forest Service personnel, the presence of cans would not improve cleanliness appreciably.[10]

Table VIII

Pack Out Areas and Litter Index

Type of Site	Mean Litter Index	Mean Visitor Days per Site
With receptacle	2.45	12,192
No receptacles	2.78	10,561
Receptacles had never been installed	2.50	2,952
Originally had receptacles, are now pack-out	3.12	10,119
All sites	2.51	11,870

Table IX examines the three-way relationship between number of visitors, number of solid waste collection points and litter index. The effect of collection site availability upon the litter index is illustrated. First the ratio of number of visitor days to number of collection sites was established for each visitor site replete with cans. Then the sites were ranked from the lowest ratio of visitors per collection site to the highest and then divided into quartiles (Column I). The litter index average increases dramatically from 1.85 for quartile I with the lowest number of visitors (155.3) per collection point to 2.99 in quartile IV which has over sixteen times as many users per collection point (2,511.9).

Clearly, the visitor areas which have fewer collection points relative to numbers of visitors accumulate far more uncollected debris than sites with a lower ratio of users per collection point. The right-hand column in Table IX illustrates that those same sites with a high ratio of visitors to collection points also have a correspondingly higher average number of visitor days. This correlation is consistant with previous statements concerning the close association between high litter indexes and large numbers of visitors.

Table IX suggests further that the availability of more collection points will reduce the incidence of litter. Environmental Protection Agency studies suggest too that the number of scheduled collections can be reduced by establishing ample collection points in well occupied recreation areas.[11] A reduction in collection costs will result.

Table IX

Visitor Days Collection Point Ratio and Litter Index

Ratio of Visitor Days to Collection Points	Mean Litter Index	Mean Visitor Days per Site
155.3*	1.85	1,427
426.0	2.28	6,815
916.6	2.74	10,238
2511.9	2.99	30,587

*This figure represents the number of collection points divided into number of visitor days and then divided into quartiles.

An attempt was made to measure the relationship between receptacle size and location upon the litter index. However, no pattern emerged from either investigation. Most collection sites had one or more twenty-four gallon size galvanized cans. Occasionally (approximately 17 percent) a larger thirty-two gallon size was utilized. However, no Forest Service pattern or regular policy for using the

larger-sized cans (including a few fifty-five gallon drums) is practiced. There is no evidence that either larger or smaller receptacles were superior. A similar observation exists for receptacle location within the visitor sites. With rare exception, all collection sites are located within short distances (thirty feet or less) from picnic and camping areas. There was no evidence to suggest that inaccessible receptacles contributed to higher litter indexes. Therefore, no meaningful correlation between either can size or location and litter index is possible. Compliance with Environmental Protection Agency guidelines on receptacle size and location are being met.[12]

Summary and Conclusion

The foregoing discussion has examined the amount and spatial pattern of uncollected solid waste in the Tonto National Forest. From these findings the following has been concluded:

(1) Solid waste deposited in trash receptacles was collected regularly and effectively. Only rarely were receptacles found to be overflowing--usually following large weekend crowds.

(2) Solid waste not deposited in established containers, but left strewn around visitor areas was gathered and removed regularly and effectively--but only if the pieces were large enough to be seen easily or at least be captured by a garden rake.

(3) Smaller pieces, small enough to pass between the teeth of a rake, were not gathered and removed. Items such as beverage can pull tabs, cigarette filters, scraps of paper, etc. effectively escape the collection crews.

(4) The solid waste collection system is least effective at those sites which attract the largest numbers of visitors. Such a conclusion was unexpected in view of the fact that these sites which are used most intensively also are the

most accessible to collection crews and where the greatest investment in site development has been made by the U. S. Forest Service. It is somewhat ironic that the same areas which are most important in terms of visitor use are also the most poorly served by the collection system.

(5) The smaller, more remote visitor areas are cleanest, due not to superior solid waste management, but solely by virtue of their much lower attendance.[13] Given the limited effectiveness of the existing collection system, only areas with few visitors remain relatively clean.

In summary, the collection system employed in the Tonto National Forest is effective at emptying established receptacles and at gathering large, scattered pieces of debris. However, the system fails to collect smaller items when they are discarded outside of established receptacles. Where recreational areas are used most intensively, an actual build-up of this "hard core" litter is occurring. In sparsely used areas the accumulation remains slight, but due only to less littering, not better maintenance.

There is no evidence to suggest that the accumulation of litter is a problem unique to the Tonto National Forest.[14] With labor costs and the demand for outdoor recreation spiralling upward, the delemma may be universal. Meanwhile, the danger from uncollected waste intensifies. Where is litter accumulated more rapidly? What is the impact on the eco-system? How long can the build-up continue? Will recreational administrators arrest the litter build-up before our natural areas lose that very naturalness which renders them so attractive and valuable to our urban-industrial society?

Recommendations

(1) Inventory and monitor the type and amount of solid waste which is not being effectively collected by present system of solid waste collection. It is

very doubtful if many authorities are fully aware of the actual build-up that has occurred.

(2) Establish quantitative standards above which accumulation will not be permitted. Permissable levels should be based upon ecological, esthetical and financial criteria--with no emphasis on the latter.

(3) Instruct and equip collection crews to gather small debris regularly, in addition to their customary duties. More time or larger crews and special tools will be required. Presently, such thorough policing of small debris is limited largely to off-season efforts by Forest Service personnel and occasional assistance from public service groups (Boy Scouts, etc.) and probationaries assigned by sympathetic judges.

For the worst areas litter accumulation is so severe already that special "restoration crews" may be required in order to reduce the backlog to a level that regular collection crews can manage.

(4) Provide large, mechanically-loaded receptacles (e.g., Dempster Dumpsters) at key locations with good accessibility along the Salt and Verde Rivers and reservoirs. If properly signed, these large depositories would serve the touring or long-term camper with excessive volumes of housekeeping wastes. Lower collection costs would result. In areas with fewer visitors, the large receptacles could be utilized as transfer stations for temporary storage of wastes thereby also reducing collection costs.[15]

(5) More education (e.g., signing and other propaganda) is necessary, in general, but especially for pack-out locations. A full explanation should be available at each site.[16]

(6) Pack-out arrangements should be attempted in visitor areas that are used lightly (less than 5,000 visitor days per year) and located on dead end roads. These criteria do not include the lower Salt River Areas (e.g., Bulldog Blue Point,

Coons Bluff) which are currently designated as pack-out. However, places such as See Canyon and Bear Creek in the Payson Ranger District, Sheepsbridge in Cave Creek Ranger District, Peralta in Mesa Ranger District, and Pigeon Springs and Camp Reno in the Roosevelt Ranger District do meet the stated criteria. Present collection at these latter sites requires an inordinate investment in man/equipment hours.

(7) Special provisions must be given to intensively used areas. Solid waste needs seem to increase "geometrically" with increases in number of visitors. Providing thirty-two gallon containers, more collection points and additional time for collection are minimal requirements.

(8) Administration of recreational areas within the Tonto National Forest needs reorganization. Perhaps it is only natural that most Forest Service personnel are more concerned with lumbering, grazing and mining than with recreation. The effect nonetheless is a prevailing attitude among personnel that recreation does not, and maybe should not, have the top priority. Consequently, recreational needs compete, ineffectively, with other Forest Service responsibilities.

Optimum administration of recreational areas requires considerable autonomy. Such independence can be achieved by administrative reorganization within the framework of the Forest Service. If a separate division with clear responsibilities and matching authority were established to manage designated recreational zones, problems peculiar to recreation would receive appreciably more attention. Another means of gaining more recreation-minded administrations would be to reclassify areas used primarily for recreation purposes as National Recreational Areas. The recreational lands adjoining the Salt River, the Verde River and their reservoirs meet the criteria of the Department of the Interior.[17] Either one of these proposals could give recreational administrations the degree of autonomy necessary for greater focus upon changing problems peculiar to their domain.

FOOTNOTES

1. Council on Environmental Quality, Annual Report, 1971, p. 97, 265.

2. While there has been considerable research on the broad field of solid waste management (See U.S. Environmental Protection Agency, Solid WasteManagement: A List of Available Literature, SW-58.13, 1972), substantive literature focusing directly upon visitor-related solid waste problems in recreational areas is in very limited supply. The following sources constitute the bulk of primary data available directly on solid waste problems in recreational areas: David A. Badger, Preliminary Inventory and Evaluation of Solid Waste Handling Practices, Tonto National Forest, Supervisor's Office, Tonto National Forest, Phoenix, Arizona, March 29, 1972; H.R. Little, Design Criteria for Solid Waste Management in Recreational Areas, SW-41ts, EPA, 1971; Public Health Service, Environmental Health Practice in Recreation Areas, Publication No. 1195, 1965; Charles S. Spooner, Solid Waste Management in Recreational Forest Areas, U.S. Environmental Protection Agency, Solid Waste Management Office, 1971; U.S. Forest Service, A Report on the Solid Waste Problems of the San Isabel National Forest, September 25, 1970; L. Weaver, "Refuse andLitter Control in Recreation Areas," Public Works, Vol. 98, No. 4, April 1967, pp. 126-128, 160; and James A. Wolfe, Engineering Report on Solid Waste Collection and Disposal Lincoln National Forest, USDA, U.S. Forest Service, Southwestern Region, Albuquerque, New Mexico. April 1972.

3. The recent study conducted by the Tonto National Forest inventories and evaluates solid waste generating rates, disposal areas and candidate sanitary landfill sites, but does not examine the solid waste collection system. See Badger, op. cit.

4. This rather laborious process required (1) measuring a ten foot zone around each point (2) establishing the total number of pieces of debris on the ground and (3) classifying them as food wastes, other combustible materials, beverage can pull tabs, other non-combustible wastes or miscellany.

5. Originally, the ninety-eight sites identified in the Badger Study were chosen. However, approximately twenty of these were never located positively, while an additional fifteen were discovered.

6. Plastic liners were used in virtually all cases. This procedure complies with EPA guidelines. See Spooner, op. cit., p. 24.

7. At Pine Campground evidence of trash from nearby residences was present.

8. However, the Spooner Report establishes nearly identical waste generation rates for picnic and camping sites. See Spooner, op. cit., p. 2.

9. Spooner, op. cit., p. 24.

FOOTNOTES (Cont.)

10. Interview with Mr. James Hibbetts, Cave Creek District Ranger, Tonto National Forest, June 1972.

11. Spooner, op. cit., p. 25.

12. Ibid., p. 21

13. Cursory observation suggests that perhaps the smaller, less accessible recreation areas are frequented by individuals with greater appreciation of natural areas and their preservation. These types of visitors may be less prone to littering. Such speculation warrants further research.

14. Mr. Martin E. Wurbs, co-author of this study, is currently conducting research on litter in Maricopa County Arizona (Phoenix) Regional Parks and his preliminary findings indicate a sizable litter build-up.

15. Spooner, op. cit., p. 25. A similar recommendation has been made recently for the Lincoln National Forest. See Wolfe, op. cit.

16. Spooner, op. cit., p. 21.

17. National Park Service, "Criteria for Selecting National Recreational Areas", Criteria for Selection of National Parklands and National Landmarks, Department of Interior, pp. 17-19.

TABLE I

MEAN AMOUNTS OF UNCOLLECTED DEBRIS

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
Cave Creek District					
1. Bartlett Lake	37.9/[1]	25.3	--	--	--
2. Cave Creek	40.5	20.3	46.6	5.0	--
3. C.C.C. Camp	11.3	8.5	--	1.3	--
4. Horseshoe (to gage sta.)	--	--	--	23.5	26.0
5. Horseshoe Lake	40.7	29.5	99.6	10.8	--
6. Horseshoe Lake fish. area	160.6	147.1	--	46.2	--
7. Rattlesnake (Bartlett)	14.8	13.1	--	4.8	--
8. Riverside	--	--	--	--	32.0
9. Roundtree Canyon	--	--	--	13.2	1.5
10. Seven Springs	43.8	23.7	134.2	6.0	--
11. Sheep Bridge	45.3	45.3	--	--	23.0
Globe District					
12. C.C.C. Camp	62.0	62.0	--	44.5	32.0
13. Jones Water	13.6	7.4	17.7	5.3	--
14. Kellner Canyon	45.0	22.5	57.8	38.0	--
15. Oak Flats	20.7	14.2	30.9	8.5	--
16. Lower Pinal	6.3	4.4	5.3	4.1	--
17. Upper Pinal	2.75	1.8	5.2	4.0	--
18. Pioneer Pass	3.8	3.2	11.1	3.5	--
19. Throwdown "A"	--	--	--	--	6.0
20. Throwdown "B"	18.0	18.0	--	7.3	--
21. Throwdown "C"	8.0	8.0	--	4.0	3.0
22. Warnica Springs	24.0	24.0	24.2	16.0	--
Mesa District					
23. Acacia	68.7	16.9	74.8	25.5	--
24. Blue Point	--	--	109.0	12.8	--
25. Boulder Creek	55.4	11.1	133.3	24.8	--
26. Bulldog	36.0	36.0	--	--	49.0
27. Butcher Jones	74.9	30.4	114.1	23.5	--
28. Coons Bluff	--	--	82.8	21.5	--
29. Dry Camp	--	--	--	5.8	--
30. First Water	--	--	--	11.8	--
31. Granite Reef	20.8	12.8	60.4	17.2	--
32. Laguna	155.8	22.6	--	51.0	--
33. Palo Verde	64.2	24.9	149.5	36.3	--
34. Peralta	43.0	4.4	--	--	10.0
35. Phon D. Sutton	47.2	37.5	80.2	20.3	--
36. The Point	--	--	208.0	36.0	--
37. Polly Varden	--	--	--	12.3	28.0
38. Port of Phoenix	27.7	20.9	--	14.3	--

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
39. Saguaro Del Norte	71.2	27.9	29.1	15.7	--
40. Sugarloaf	--	--	--	--	5.0
41. Tejanos Springs	--	--	--	--	1.0
42. Tortilla	16.8	16.8	--	--	2.5
43. #1 Unassigned	--	--	118.0	19.0	--
Payson District					
44. Bear Flat	31.5	26.9	--	5.0	--
45. Christopher Creek	13.8	13.8	109.8	3.5	--
46. Upper Christopher Creek	31.0	7.75	--	--	14.0
47. Flowing Springs	34.5	17.2	--	3.5	--
48. Holder Grave	16.2	12.2	--	5.1	--
49. Houston Mesa	43.5	27.4	--	--	12.8
50. Pine	41.5	31.1	25.2	2.7	--
51. Ponderosa	3.8	3.8	16.2	0.75	--
52. Sharp Creek	24.1	16.0	--	--	21.0
53. Sycamore	28.8	14.2	68.9	2.4	--
54. Lower Tonto Creek	23.1	23.1	80.8	3.25	--
55. Upper Tonto Creek	20.6	10.3	--	--	4.5
56. Verde Crossing	59.0	29.5	--	8.3	--
Pleasant Valley District					
57. Airplane Flat	17.5	7.0	--	--	3.0
58. Bottle Springs	34.0	17.0	--	4.0	--
59. Broadtree Saddle	7.0	3.5	--	--	4.0
60. Canyon Creek	10.3	5.6	--	--	2.0
61. Ellenwood Crossing	22.0	11.0	--	--	14.5
62. Fisherman's Point	27.0	13.5	--	--	13.0
63. Haigler Creek	12.8	6.4	12.0	--	14.0
64. McFadden Peak	7.0	3.5	--	--	7.0
65. Naeglin Canyon	--	--	--	--	4.0
66. Ramer Corral	5.0	2.5	--	--	2.0
67. Reynolds Creek	10.0	5.0	--	--	5.0
68. Rose Creek	25.4	13.9	85.2	1.2	--
69. Lower Valentine Canyon	4.0	1.9	--	--	2.0
70. Workman's Creek	11.2	4.9	--	--	4.0
Roosevelt District					
71. "A" Roosevelt	85.0	85.0	--	--	44.0
72. Anglers Inn	10.4	10.4	--	--	6.0
73. Apache Lake	13.9	12.3	23.1	13.0	--
74. Bachelor's Cove	33.4	33.4	--	--	16.0
75. Burnt Corral	20.2	12.7	48.1	5.7	--
76. Carson's Landing	21.5	21.4	--	7.5	4.0
77. Cholla Bay	15.7	15.7	--	--	11.0
78. Cottonwoods	55.0	55.0	--	27.4	48.0
79. Grapevine	9.0	9.0	--	7.8	7.0
80. Horse Pasture	8.9	8.3	--	--	2.0

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
81. Hotel Point	33.9	25.4	68.2	15.8	--
82. Inspiration Point	15.5	15.5	53.5	29.5	--
83. Mile Wash	--	--	--	--	23.0
84. Mills Canyon	--	--	--	--	5.0
85. Pigeon Springs	17.5	17.5	14.0	6.0	--
86. Porter Springs	13.8	11.6	--	--	5.0
87. Salt River	93.0	93.0	--	--	14.0
88. Schoolhouse Point	12.9	12.9	--	--	9.0
89. Windy Hill	12.1	10.0	--	--	4.0
Tonto Basin District					
90. Camp Reno	4.0	4.0	--	--	9.0
91. North Roosevelt	11.2	6.0	--	4.4	9.0
92. Sheep Driveway	--	--	--	--	6.0
93. Tonto Creek Box	--	--	--	--	3.0

[1]These figures are the Mean Amounts of uncollected debris for each type of category at each study area.

TABLE II

LITTER INDEX

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Cave Creek District						
Bartlett Lake	3 /[1]	4	-	-	-	3.50 /[2]
Cave Creek	3	3	2	2	-	2.50
C.C.C. Camp	1	2	-	1	-	1.33
Horseshoe (to Gage Sta.)	-	-	-	4	4	4.00
Horseshoe Lake	3	4	4	3	-	3.50
Horseshoe Lake fishing area	4	4	-	4	-	4.00
Rattlesnake (Bartlett)	2	2	-	-	-	2.00
Riverside	-	-	-	4	-	4.00
Roundtree Canyon	-	-	3	3	-	3.00
Seven Springs	4	3	4	2	-	3.25
Sheep Bridge	4	4	-	-	4	4.00
Globe District						
C.C.C. Camp	4	4	-	4	4	4.00
Jones Water	2	1	1	2	-	1.50
Kellner Canyon	4	3	2	4	-	3.25

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Oak Flats	2	3	2	2	-	2.25
Lower Pinal	1	1	1	1	-	1.00
Upper Pinal	1	1	1	1	-	1.00
Pioneer Pass	1	1	1	1	-	1.00
Throwdown "A"	-	-	-	-	2	2.00
Throwdown "B"	2	3	-	2	-	2.33
Throwdown "C"	1	1	-	1	1	1.00
Warnica Springs	3	3	2	3	-	2.75
Mesa District						
Acacia	4	3	3	4	-	3.50
Blue Point	-	-	4	3	-	3.50
Boulder Creek	4	2	4	4	-	3.50
Bulldog	3	4	-	-	4	3.66
Butcher Jones	4	4	4	4	-	4.00
Coons Bluff	-	-	3	4	-	3.50
Dry Camp	-	-	-	2	-	2.00
First Water	-	-	-	3	-	3.00
Granite Reef	2	2	3	3	-	2.50
Laguna	4	3	-	4	-	3.66
Palo Verde	4	4	4	4	-	4.00
Peralta	4	1	-	-	3	2.66
Phon D. Sutton	4	4	3	3	-	3.50
The Point	-	-	4	4	-	4.00
Polly Varden	-	-	-	3	4	3.50
Port of Phoenix	3	3	-	3	-	3.00
Saguaro Del Norte	4	4	2	3	-	3.25
Sugarloaf	-	-	-	-	2	2.00
Tejanos Springs	-	-	-	-	1	1.00
Tortilla	2	3	-	-	-	2.50
#1 Unassigned	-	-	4	3	-	3.50
Payson District						
Bear Flat	3	4	-	2	-	3.00
Christopher Creek	2	2	4	1	-	2.25
Upper Christopher Creek	3	1	-	-	3	2.33
Flowing Springs	3	3	-	-	-	3.00
Holder Grave	2	2	-	2	-	2.00
Houston Mesa	4	4	-	-	3	3.66
Pine	4	4	2	1	-	2.75
Ponderosa	1	1	1	1	-	1.00
Sharp Creek	3	3	-	-	4	3.33
Sycamore	3	3	3	1	-	2.50
Lower Tonto Creek	3	3	3	1	-	2.50
Upper Tonto Creek	2	2	-	-	2	2.00
Verde Crossing	4	4	-	2	-	3.33

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Pleasant Valley District						
Airplane Flat	2	1	-	-	1	1.33
Bottle Springs	3	3	1	-	-	2.33
Broadtree Saddle	1	1	-	-	1	1.00
Canyon Creek	1	1	-	-	1	1.00
Ellenwood Crossing	3	2	-	-	3	2.66
Fisherman's Point	3	2	-	-	3	2.66
Haigler Creek	2	1	1	-	3	1.75
McFadden Peak	1	1	-	-	2	1.33
Naeglin Canyon	-	-	-	-	1	1.00
Ramer Corral	1	1	-	-	1	1.00
Reynolds Creek	1	1	-	-	2	1.33
Rose Creek	3	2	3	1	-	2.25
Lower Valentine Canyon	1	1	-	-	1	1.00
Workman's Creek	1	1	-	-	1	1.00
Roosevelt District						
"A" Roosevelt	4	4	-	-	4	4.00
Anglers Inn	1	2	-	-	2	4.00
Apache Lake	2	2	1	3	-	2.00
Bachelor's Cove	3	4	-	-	4	3.66
Burnt Corral	2	2	2	2	-	2.00
Carson's Landing	3	3	-	2	1	2.25
Cholla Bay	2	3	-	-	3	2.66
Cottonwoods	4	4	-	4	4	4.00
Grapevine	1	2	-	2	2	1.75
Horse Pasture	1	2	-	-	1	1.33
Hotel Point	3	4	3	3	-	3.25
Inspiration Point	2	3	2	4	-	2.75
Mile Wash	-	-	-	-	4	4.00
Mills Canyon	-	-	-	-	2	2.00
Pigeon Springs	2	3	1	2	-	2.00
Porter Springs	2	2	-	-	2	2.00
Salt River	4	4	-	-	3	3.66
Schoolhouse Point	2	2	-	-	3	2.33
Windy Hill	1	2	-	-	1	1.33
Tonto Basin District						
Camp Reno	1	1	-	-	3	1.66
North Roosevelt	1	1	-	2	3	1.75
Sheep Driveway	-	-	-	-	2	2.00
Tonto Creek Box	-	-	-	-	1	1.00

[1]These figures represent the mean data converted to quartiles.

[2]The Litter Index represents the mean of the quartiles.

TABLE III

ADDITIONAL DESCRIPTIVE VISITOR AREA DATA

	Time Zone	Visitor Days	Water Oriented	Site Type
Cave Creek District				
Bartlett Lake	1 /[1]	94,900/[2]	Yes	B /[3]
Cave Creek	1	3,650	No	D
C.C.C. Camp	1	unknown	No	B
Horseshoe (to Gage Station)	1	14,600	Yes	A
Horseshoe Lake	1	25,550	Yes	D
Horseshoe Lake fishing area	1	unknown	Yes	B
Rattlesnake (Bartlett)	1	unknown	Yes	B
Riverside	1	3,650	Yes	A
Roundtree Canyon	2	unknown	No	A
Seven Springs	1	6,570	Yes	D
Sheep Bridge	2	1,460	Yes	B
Globe District				
C.C.C. Camp	2	unknown	No	B
Jones Water	2	2,190	No	D
Kellner Canyon	2	1,095	No	D
Oak Flats	1	2,920	No	D
Lower Pinal	2	3,980	No	D
Upper Pinal	2	unknown	No	D
Pioneer Pass	2	2,016	No	D
Throwdown "A"	2	unknown	No	A
Throwdown "B"	2	unknown	No	B
Throwdown "C"	2	unknown	No	B
Warnica Springs	2	260	No	D
Mesa District				
Acacia	1	41,844	Yes	C
Blue Point	1	74,529	Yes	B
Boulder Creek	1	5,642	Yes	C
Bulldog	1	58,884	No	B
Butcher Jones	1	10,920	Yes	C
Coons Bluff	1	31,072	Yes	B
Dry Camp	1	22,119	No	A
First Water	1	6,322	No	A
Granite Reef	1	10,950	Yes	D
Laguna	1	24,462	Yes	B
Palo Verde	1	5,840	Yes	C
Peralta	1	7,300	No	B
Phon D. Sutton	1	80,613	Yes	D
The Point	1	2,898	Yes	B
Polly Varden	1	1,562	Yes	A
Port of Phoenix	1	unknown	Yes	B

	Time Zone	Visitor Days	Water Oriented	Site Type
Saguaro Del Norte	1	60,529	Yes	C
Sugarloaf	1	4,259	Yes	A
Tejanos Springs	1	728	Yes	A
Tortilla	1	31,601	No	D
#1 Unassigned	1	2,606	Yes	B
Payson District				
Bear Flat	2	4,216	Yes	B
Christopher Creek	2	28,700	Yes	D
Upper Christopher Creek	2	496	Yes	B
Flowing Springs	2	6,944	Yes	B
Holder Grave	2	496	No	B
Houston Mesa	2	12,400	Yes	B
Pine	2	5,700	No	D
Ponderosa	2	17,300	No	D
Sharp Creek	2	248	Yes	B
Sycamore	2	6,400	Yes	D
Lower Tonto Creek	2	39,100	Yes	D
Upper Tonto Creek	2	1,488	Yes	B
Verde Crossing	2	8,928	Yes	B
Pleasant Valley District				
Airplane Flat	3	unknown	No	B
Bottle Springs	3	992	No	B
Broadtree Saddle	3	214	No	B
Canyon Creek	3	4,066	No	B
Ellenwood Crossing	3	428	No	B
Fisherman's Point	3	200	No	B
Haigler Creek	3	3,210	Yes	D
McFadden Peak	3	214	No	B
Naeglin Canyon	3	992	Yes	A
Ramer Corral	3	124	No	B
Reynolds Creek	3	214	No	B
Rose Creek	3	1,284	No	D
Lower Valentine Canyon	3	unknown	Yes	B
Workman's Creek	3	2,140	Yes	B
Roosevelt District				
"A" Roosevelt	2	unknown	No	B
Anglers Inn	2	800	Yes	B
Apache Lake	2	8,000	Yes	D
Bachelor's Cove	2	7,300	Yes	B
Burnt Corral	2	31,900	Yes	D
Carson's Landing	2	4,745	Yes	B
Cholla Bay	2	10,400	Yes	B
Cottonwoods	2	1,460	Yes	B
Grapevine	2	1,000	No	B
Horse Pasture	2	12,300	Yes	B

	Time Zone	Visitor Days	Water Oriented	Site Type
Hotel Point	2	10,400	No	C
Inspiration Point	2	900	No	C
Mile Wash	2	730	Yes	A
Mills Canyon	2	1,460	Yes	A
Pigeon Springs	2	132	No	D
Porter Springs	2	900	Yes	B
Salt River	2	unknown	Yes	B
Schoolhouse Point	2	800	Yes	B
Windy Hall	2	12,410	Yes	B
Tonto Basin District				
Camp Reno	2	9,123	No	B
North Roosevelt	2	21,721	Yes	B
Sheep Driveway	2	730	Yes	A
Tonto Creek Box	2	730	Yes	A

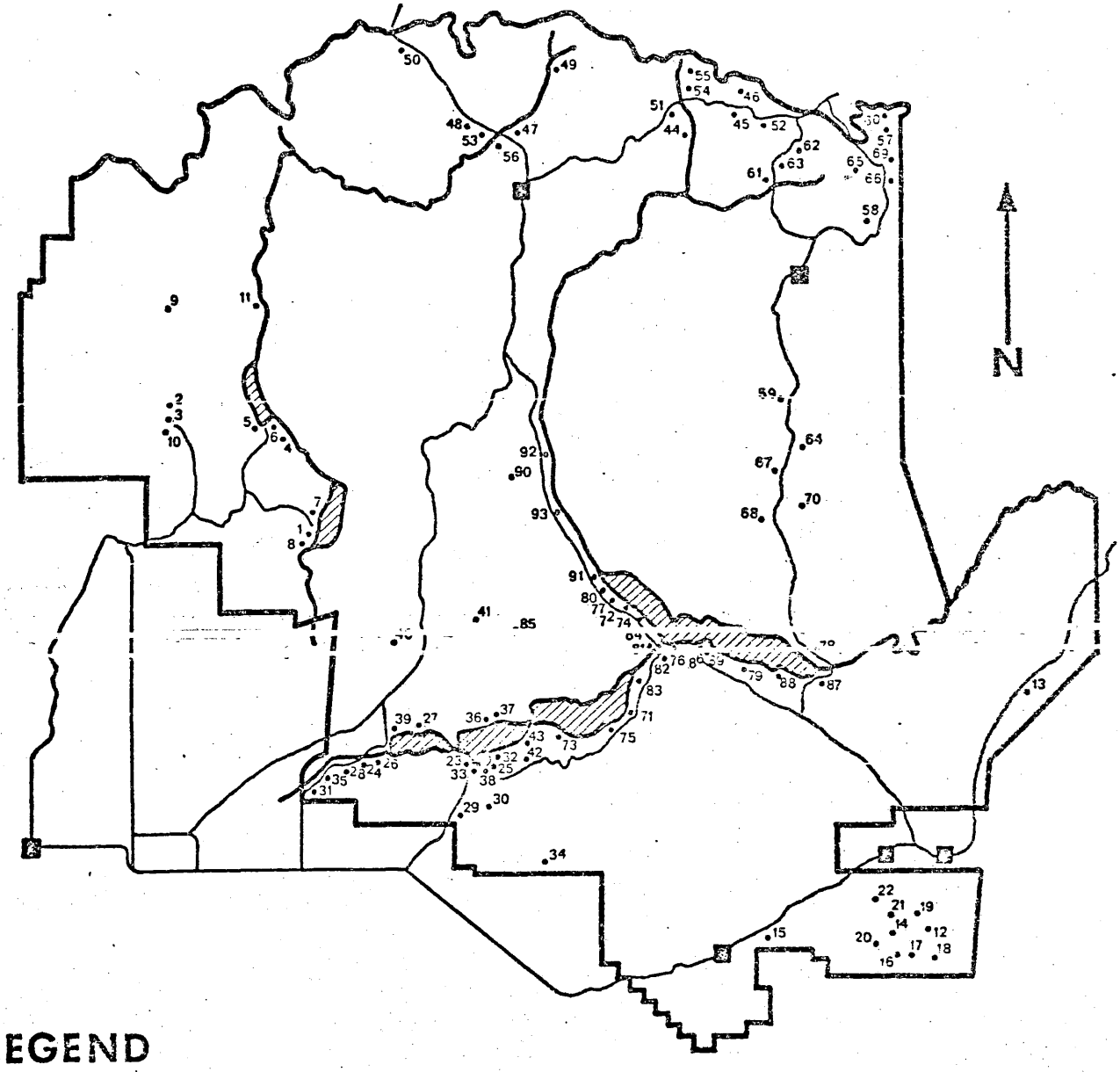
[1]Zone 1 = less than 1.5 hours from Phoenix, Zone 2 = 1.5 to 3.0 hours from Phoenix, Zone 3 = more than 3.0 hours from Phoenix.

[2]Source: Recreational Inventory Management, U. S. Forest Service, 1970.

[3]Type A = Camping and Picnicking with no facilities, Type B = Camping and picnicking with trash receptacles only, Type C = Picnicking with table and receptacles, Type D = Camping and Picnicking with tables and receptacles.

TONTO NATIONAL FOREST

STUDY SITES



LEGEND

- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA
- STUDY SITE

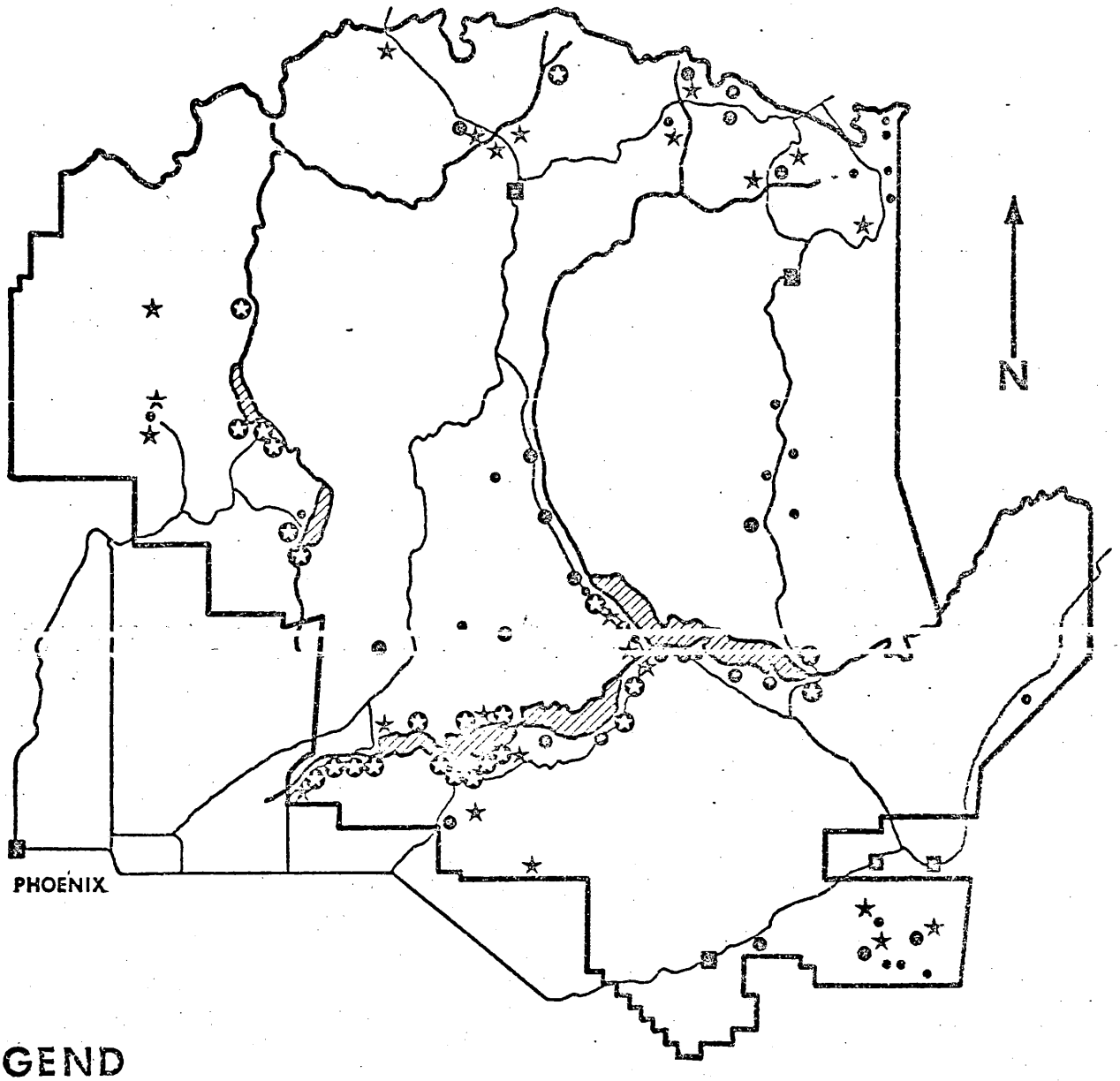
NOTE: SITE NUMBER CORRESPONDS WITH LISTING ON TABLE 1

SCALE: 1 INCH EQUALS 13 MILES

FIG. 1

WB

LITTER INDEX QUARTILES BY STUDY SITES



LEGEND

- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

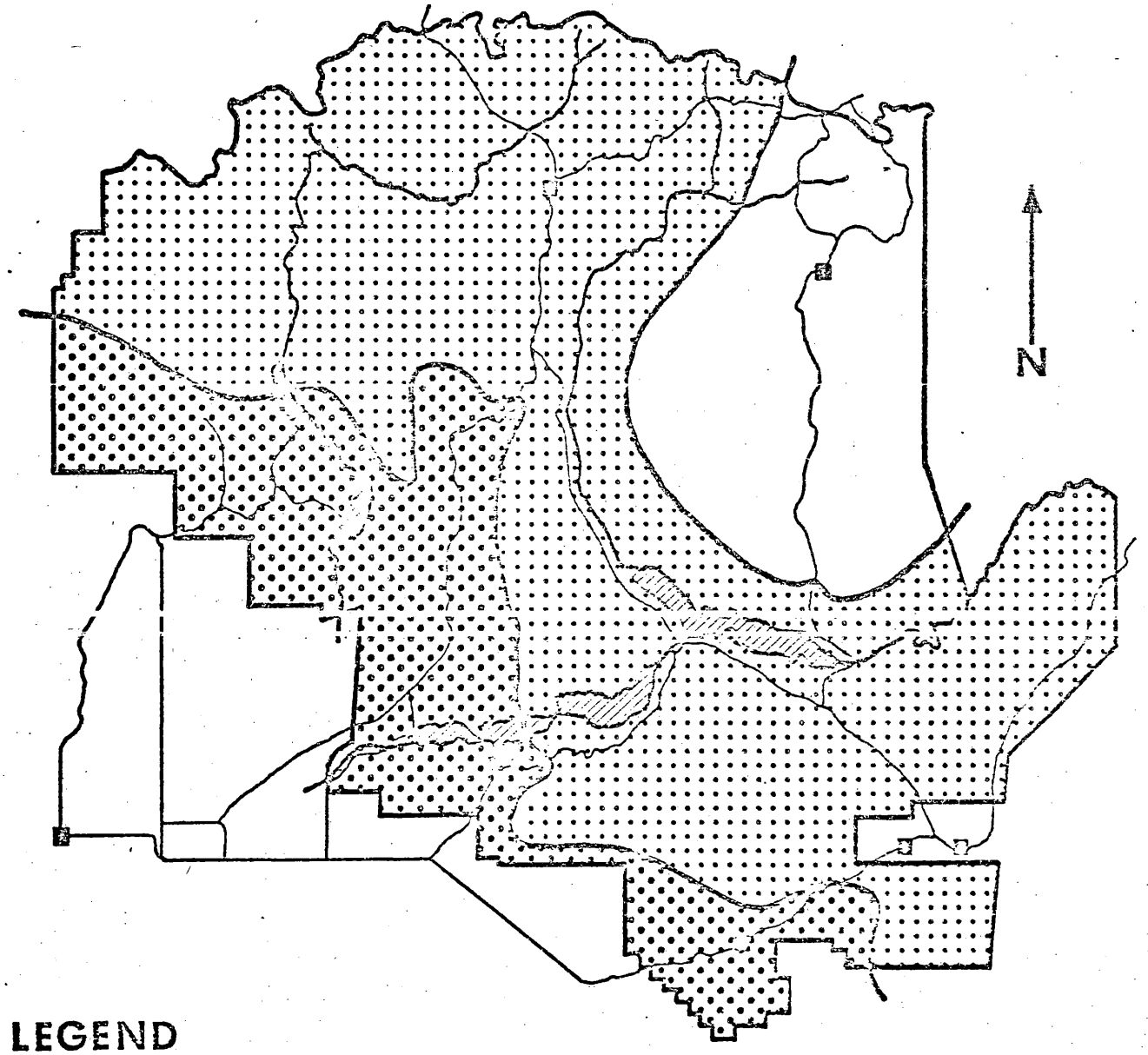
- QUARTILE 1 CLEANEST
- QUARTILE 2
- QUARTILE 3
- QUARTILE 4 LEAST CLEAN

SCALE: 1 INCH EQUALS 13 MILES

FIG. 2

WB

LITTER INDEX BY TIME ZONE



LEGEND

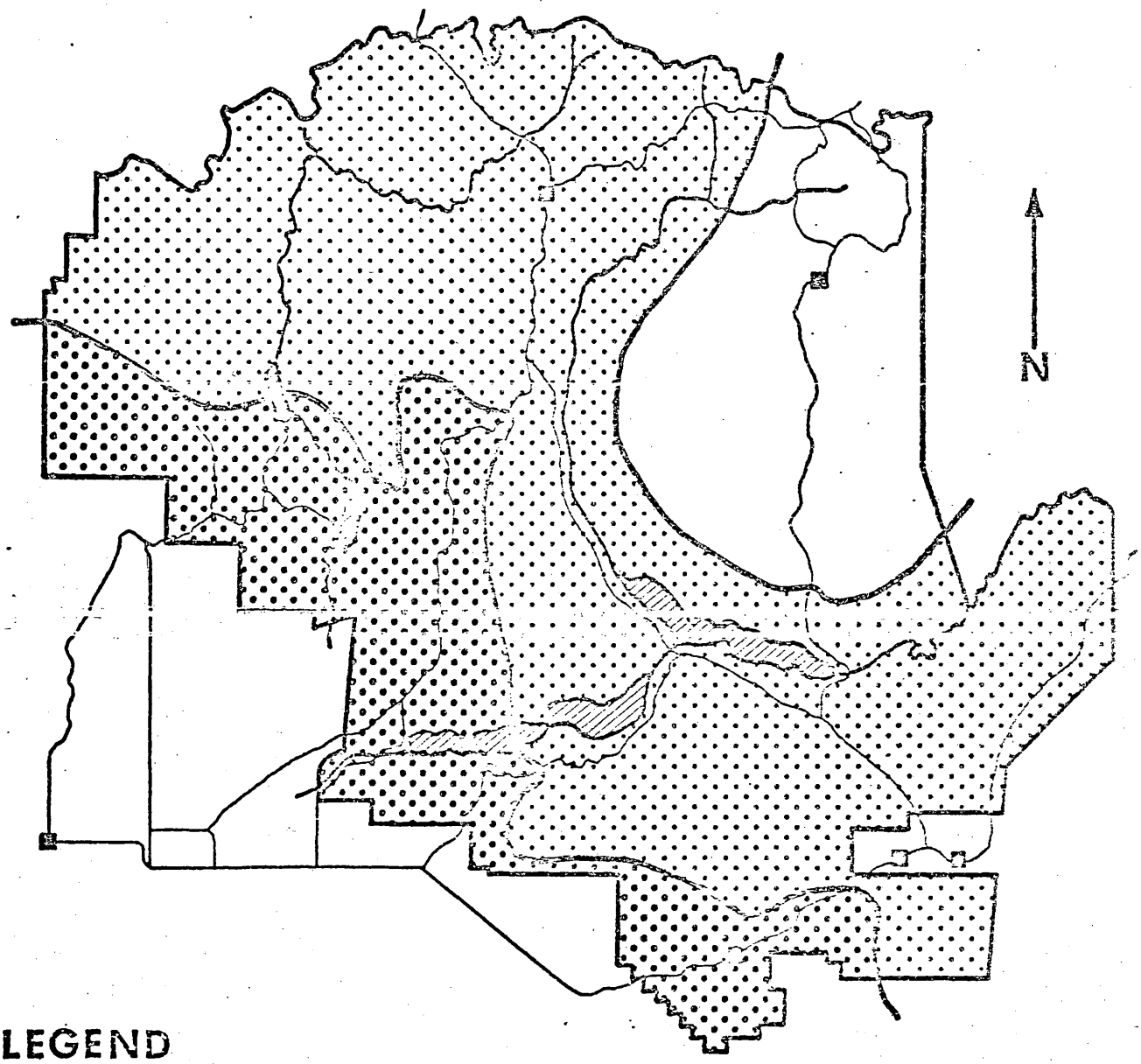
- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

SCALE: 1 INCH EQUALS 13 MILES

- TIME ZONE 1
  LESS THAN 1.5 HOURS
  FROM PHOENIX
  MEAN LITTER INDEX 3.09
- TIME ZONE 2
  1.5 TO 3.0 HOURS
  FROM PHOENIX
  MEAN LITTER INDEX 2.52
- TIME ZONE 3
  MORE THAN 3 HOURS
  FROM PHOENIX
  MEAN LITTER INDEX 1.56

FIG. 3

VISITOR DAYS BY TIME ZONE



LEGEND

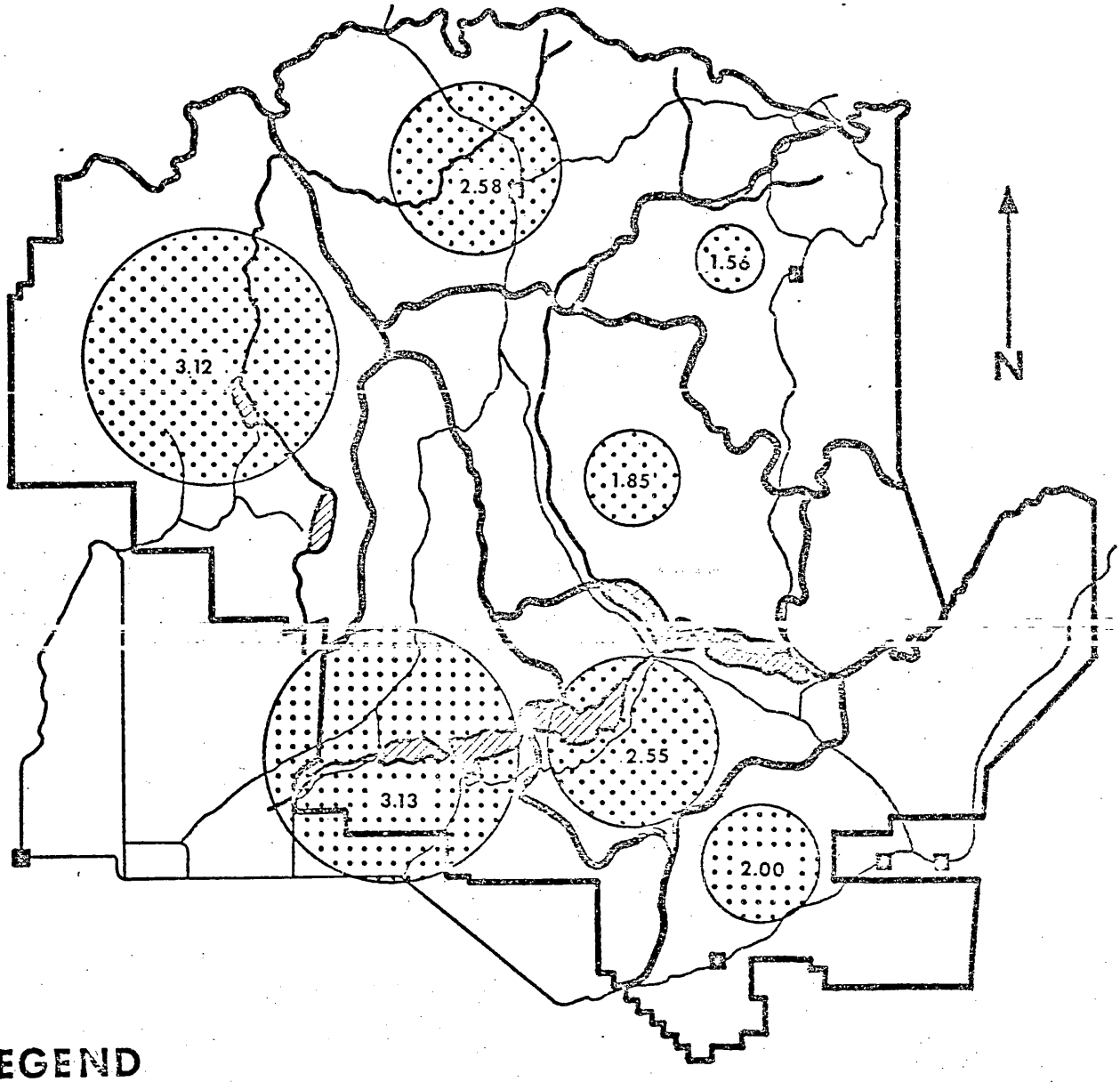
- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

SCALE: 1 INCH EQUALS 13 MILES

- TIME ZONE 1
  LESS THAN 1.5 HOURS FROM PHOENIX
  TOTAL VISITOR DAYS
  636,520
- TIME ZONE 2
  1.5 TO 3 HOURS FROM PHOENIX
  TOTAL VISITOR DAYS
  285,338
- TIME ZONE 3
  GREATER THAN 3 HOURS FROM PHOENIX
  TOTAL VISITOR DAYS
  14,078

FIG. 4

LITTER INDEX BY RANGER DISTRICT



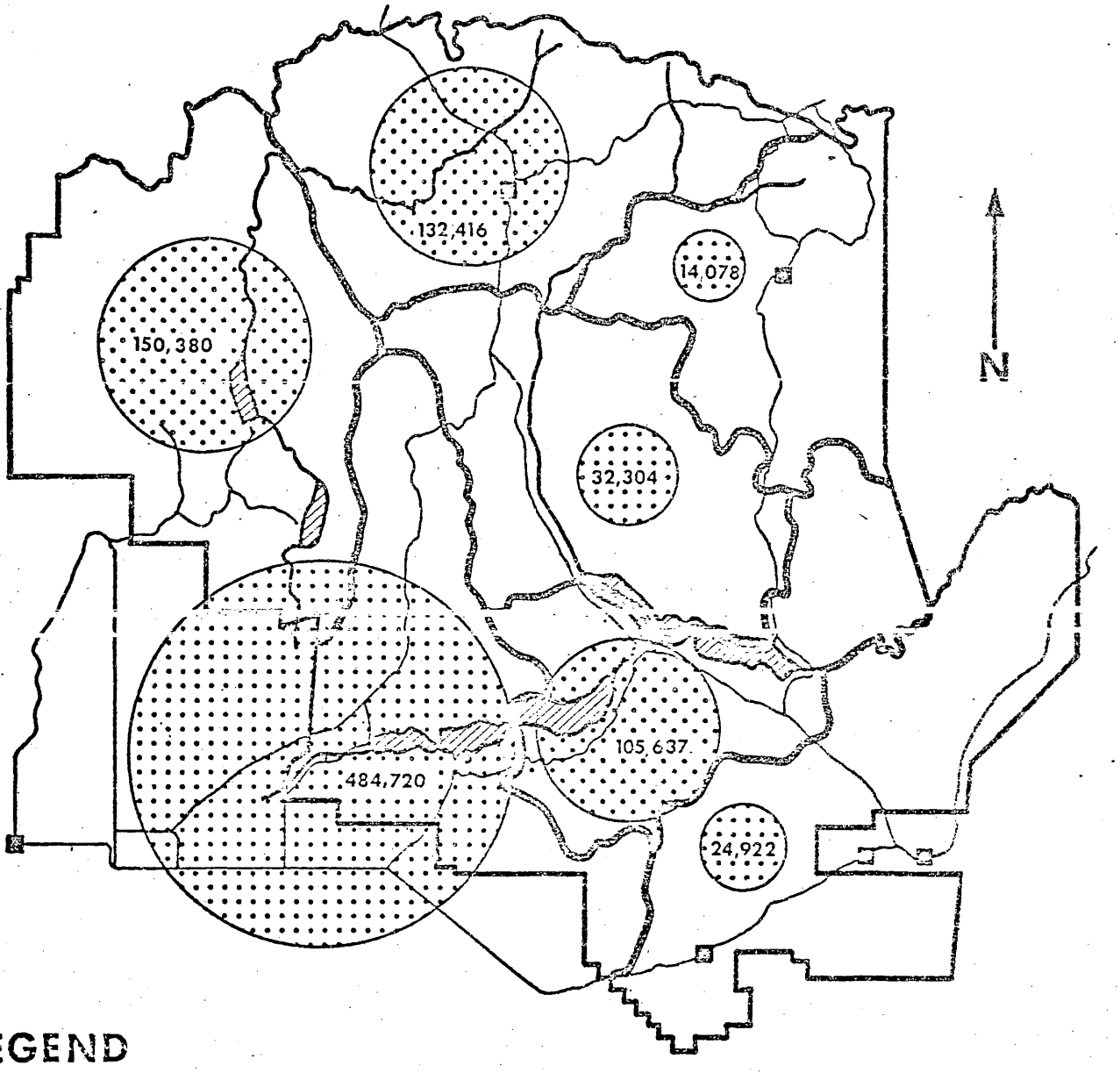
LEGEND

- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

SCALE: 1 INCH EQUALS 13 MILES

FIG. 5

VISITOR DAYS BY RANGER DISTRICT



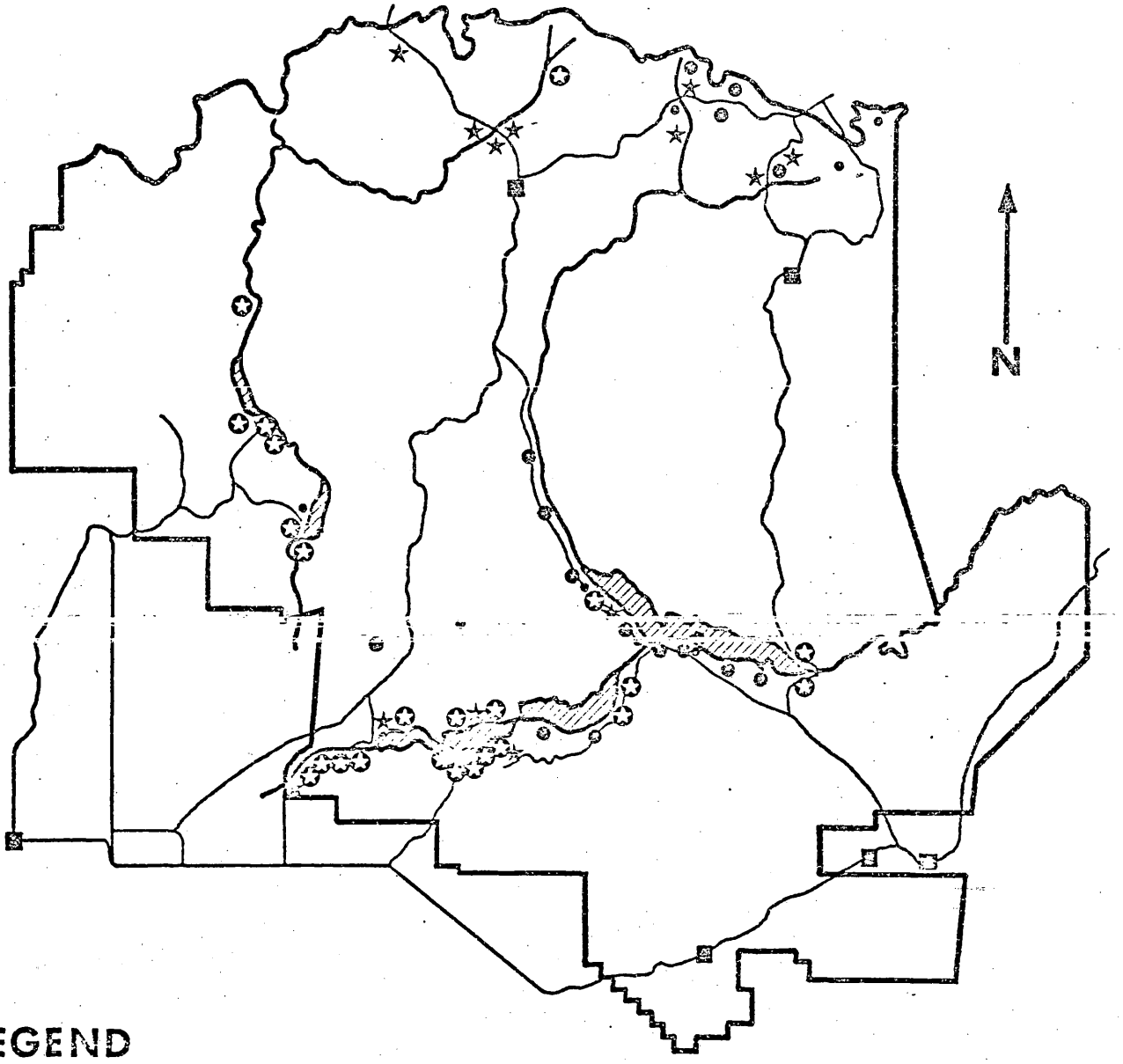
LEGEND

- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

SCALE: 1 INCH EQUALS 13 MILES

FIG. 6

WATER ORIENTED STUDY SITES



LEGEND

- FOREST BOUNDARY
- RIVER
- RESERVOIR
- MAJOR ROAD
- URBAN AREA

- QUARTILE 1 CLEANEST
- QUARTILE 2
- QUARTILE 3
- QUARTILE 4 LEAST CLEAN

SCALE: 1 INCH EQUALS 13 MILES

FIG. 7

WB

TABLE I

MEAN AMOUNTS OF UNCOLLECTED DEBRIS

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
Cave Creek District					
1. Bartlett Lake	37.9/[1]	25.3	--	--	--
2. Cave Creek	40.5	20.3	46.6	5.0	--
3. C.C.C. Camp	11.3	8.5	--	1.3	--
4. Horseshoe (to gage sta.)	--	--	--	23.5	26.0
5. Horseshoe Lake	40.7	29.5	99.6	10.8	--
6. Horseshoe Lake fish. area	160.6	147.1	--	46.2	--
7. Rattlesnake (Bartlett)	14.8	13.1	--	4.8	--
8. Riverside	--	--	--	--	32.0
9. Roundtree Canyon	--	--	--	13.2	1.5
10. Seven Springs	43.8	23.7	134.2	6.0	--
11. Sheep Bridge	45.3	45.3	--	--	23.0
Globe District					
12. C.C.C. Camp	62.0	62.0	--	44.5	32.0
13. Jones Water	13.6	7.4	17.7	5.3	--
14. Kellner Canyon	45.0	22.5	57.8	38.0	--
15. Oak Flats	20.7	14.2	30.9	8.5	--
16. Lower Pinal	6.3	4.4	5.3	4.1	--
17. Upper Pinal	2.75	1.8	5.2	4.0	--
18. Pioneer Pass	3.8	3.2	11.1	3.5	--
19. Throwdown "A"	--	--	--	--	6.0
20. Throwdown "B"	18.0	18.0	--	7.3	--
21. Throwdown "C"	8.0	8.0	--	4.0	3.0
22. Warnica Springs	24.0	24.0	24.2	16.0	--
Mesa District					
23. Acacia	68.7	16.9	74.8	25.5	--
24. Blue Point	--	--	109.0	12.8	--
25. Boulder Creek	55.4	11.1	133.3	24.8	--
26. Bulldog	36.0	36.0	--	--	49.0
27. Butcher Jones	74.9	30.4	114.1	23.5	--
28. Coons Bluff	--	--	82.8	21.5	--
29. Dry Camp	--	--	--	5.8	--
30. First Water	--	--	--	11.8	--
31. Granite Reef	20.8	12.8	60.4	17.2	--
32. Laguna	155.8	22.6	--	51.0	--
33. Palo Verde	64.2	24.9	149.5	36.3	--
34. Peralta	43.0	4.4	--	--	10.0
35. Phon D. Sutton	47.2	37.5	80.2	20.3	--
36. The Point	--	--	208.0	36.0	--
37. Polly Varden	--	--	--	12.3	28.0
38. Port of Phoenix	27.7	20.9	--	14.3	--

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
39. Saguaro Del Norte	71.2	27.9	29.1	15.7	--
40. Sugarloaf	--	--	--	--	5.0
41. Tejanos Springs	--	--	--	--	1.0
42. Tortilla	16.8	16.8	--	--	2.5
43. #1 Unassigned	--	--	118.0	19.0	--
Payson District					
44. Bear Flat	31.5	26.9	--	5.0	--
45. Christopher Creek	13.8	13.8	109.8	3.5	--
46. Upper Christopher Creek	31.0	7.75	--	--	14.0
47. Flowing Springs	34.5	17.2	--	3.5	--
48. Holder Grave	16.2	12.2	--	5.1	--
49. Houston Mesa	43.5	27.4	--	--	12.8
50. Pine	41.5	31.1	25.2	2.7	--
51. Ponderosa	3.8	3.8	16.2	0.75	--
52. Sharp Creek	24.1	16.0	--	--	21.0
53. Sycamore	28.8	14.2	68.9	2.4	--
54. Lower Tonto Creek	23.1	23.1	80.8	3.25	--
55. Upper Tonto Creek	20.6	10.3	--	--	4.5
56. Verde Crossing	59.0	29.5	--	8.3	--
Pleasant Valley District					
57. Airplane Flat	17.5	7.0	--	--	3.0
58. Bottle Springs	34.0	17.0	--	4.0	--
59. Broadtree Saddle	7.0	3.5	--	--	4.0
60. Canyon Creek	10.3	5.6	--	--	2.0
61. Ellenwood Crossing	22.0	11.0	--	--	14.5
62. Fisherman's Point	27.0	13.5	--	--	13.0
63. Haigler Creek	12.8	6.4	12.0	--	14.0
64. McFadden Peak	7.0	3.5	--	--	7.0
65. Naeglin Canyon	--	--	--	--	4.0
66. Ramer Corral	5.0	2.5	--	--	2.0
67. Reynolds Creek	10.0	5.0	--	--	5.0
68. Rose Creek	25.4	13.9	85.2	1.2	--
69. Lower Valentine Canyon	4.0	1.9	--	--	2.0
70. Workman's Creek	11.2	4.9	--	--	4.0
Roosevelt District					
71. "A" Roosevelt	85.0	85.0	--	--	44.0
72. Anglers Inn	10.4	10.4	--	--	6.0
73. Apache Lake	13.9	12.3	23.1	13.0	--
74. Bachelor's Cove	33.4	33.4	--	--	16.0
75. Burnt Corral	20.2	12.7	48.1	5.7	--
76. Carson's Landing	21.5	21.4	--	7.5	4.0
77. Cholla Bay	15.7	15.7	--	--	11.0
78. Cottonwoods	55.0	55.0	--	27.4	48.0
79. Grapevine	9.0	9.0	--	7.8	7.0
80. Horse Pasture	8.9	8.3	--	--	2.0

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical
81. Hotel Point	33.9	25.4	68.2	15.8	--
82. Inspiration Point	15.5	15.5	53.5	29.5	--
83. Mile Wash	--	--	--	--	23.0
84. Mills Canyon	--	--	--	--	5.0
85. Pigeon Springs	17.5	17.5	14.0	6.0	--
86. Porter Springs	13.8	11.6	--	--	5.0
87. Salt River	93.0	93.0	--	--	14.0
88. Schoolhouse Point	12.9	12.9	--	--	9.0
89. Windy Hill	12.1	10.0	--	--	4.0
Tonto Basin District					
90. Camp Reno	4.0	4.0	--	--	9.0
91. North Roosevelt	11.2	6.0	--	4.4	9.0
92. Sheep Driveway	--	--	--	--	6.0
93. Tonto Creek Box	--	--	--	--	3.0

[1]These figures are the Mean Amounts of uncollected debris for each type of category at each study area.

TABLE II

LITTER INDEX

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Cave Creek District						
Bartlett Lake	3 /[1]	4	-	-	-	3.50 /[2]
Cave Creek	3	3	2	2	-	2.50
C.C.C. Camp	1	2	-	1	-	1.33
Horseshoe (to Gage Sta.)	-	-	-	4	4	4.00
Horseshoe Lake	3	4	4	3	-	3.50
Horseshoe Lake fishing area	4	4	-	4	-	4.00
Rattlesnake (Bartlett)	2	2	-	-	-	2.00
Riverside	-	-	-	4	-	4.00
Roundtree Canyon	-	-	3	3	-	3.00
Seven Springs	4	3	4	2	-	3.25
Sheep Bridge	4	4	-	-	4	4.00
Globe District						
C.C.C. Camp	4	4	-	4	4	4.00
Jones Water	2	1	1	2	-	1.50
Kellner Canyon	4	3	2	4	-	3.25

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Oak Flats	2	3	2	2	-	2.25
Lower Pinal	1	1	1	1	-	1.00
Upper Pinal	1	1	1	1	-	1.00
Pioneer Pass	1	1	1	1	-	1.00
Throwdown "A"	-	-	-	-	2	2.00
Throwdown "B"	2	3	-	2	-	2.33
Throwdown "C"	1	1	-	1	1	1.00
Warnica Springs	3	3	2	3	-	2.75
Mesa District						
Acacia	4	3	3	4	-	3.50
Blue Point	-	-	4	3	-	3.50
Boulder Creek	4	2	4	4	-	3.50
Bulldog	3	4	-	-	4	3.66
Butcher Jones	4	4	4	4	-	4.00
Coons Bluff	-	-	3	4	-	3.50
Dry Camp	-	-	-	2	-	2.00
First Water	-	-	-	3	-	3.00
Granite Reef	2	2	3	3	-	2.50
Laguna	4	3	-	4	-	3.66
Palo Verde	4	4	4	4	-	4.00
Peralta	4	1	-	-	3	2.66
Phon D. Sutton	4	4	3	3	-	3.50
The Point	-	-	4	4	-	4.00
Polly Varden	-	-	-	3	4	3.50
Port of Phoenix	3	3	-	3	-	3.00
Saguaro Del Norte	4	4	2	3	-	3.25
Sugarloaf	-	-	-	-	2	2.00
Tejanos Springs	-	-	-	-	1	1.00
Tortilla	2	3	-	-	-	2.50
#1 Unassigned	-	-	4	3	-	3.50
Payson District						
Bear Flat	3	4	-	2	-	3.00
Christopher Creek	2	2	4	1	-	2.25
Upper Christopher Creek	3	1	-	-	3	2.33
Flowing Springs	3	3	-	-	-	3.00
Holder Grave	2	2	-	2	-	2.00
Houston Mesa	4	4	-	-	3	3.66
Pine	4	4	2	1	-	2.75
Ponderosa	1	1	1	1	-	1.00
Sharp Creek	3	3	-	-	4	3.33
Sycamore	3	3	3	1	-	2.50
Lower Tonto Creek	3	3	3	1	-	2.50
Upper Tonto Creek	2	2	-	-	2	2.00
Verde Crossing	4	4	-	2	-	3.33

	Per Collection Point	Per Receptacle	Per Table	Per N.S.E.W.	Per Typical	Litter Index
Pleasant Valley District						
Airplane Flat	2	1	-	-	1	1.33
Bottle Springs	3	3	1	-	-	2.33
Broadtree Saddle	1	1	-	-	1	1.00
Canyon Creek	1	1	-	-	1	1.00
Ellenwood Crossing	3	2	-	-	3	2.66
Fisherman's Point	3	2	-	-	3	2.66
Haigler Creek	2	1	1	-	3	1.75
McFadden Peak	1	1	-	-	2	1.33
Naeglin Canyon	-	-	-	-	1	1.00
Ramer Corral	1	1	-	-	1	1.00
Reynolds Creek	1	1	-	-	2	1.33
Rose Creek	3	2	3	1	-	2.25
Lower Valentine Canyon	1	1	-	-	1	1.00
Workman's Creek	1	1	-	-	1	1.00
Roosevelt District						
"A" Roosevelt	4	4	-	-	4	4.00
Anglers Inn	1	2	-	-	2	4.00
Apache Lake	2	2	1	3	-	2.00
Bachelor's Cove	3	4	-	-	4	3.66
Burnt Corral	2	2	2	2	-	2.00
Carson's Landing	3	3	-	2	1	2.25
Cholla Bay	2	3	-	-	3	2.66
Cottonwoods	4	4	-	4	4	4.00
Grapevine	1	2	-	2	2	1.75
Horse Pasture	1	2	-	-	1	1.33
Hotel Point	3	4	3	3	-	3.25
Inspiration Point	2	3	2	4	-	2.75
Mile Wash	-	-	-	-	4	4.00
Mills Canyon	-	-	-	-	2	2.00
Pigeon Springs	2	3	1	2	-	2.00
Porter Springs	2	2	-	-	2	2.00
Salt River	4	4	-	-	3	3.66
Schoolhouse Point	2	2	-	-	3	2.33
Windy Hill	1	2	-	-	1	1.33
Tonto Basin District						
Camp Reno	1	1	-	-	3	1.66
North Roosevelt	1	1	-	2	3	1.75
Sheep Driveway	-	-	-	-	2	2.00
Tonto Creek Box	-	-	-	-	1	1.00

[1]These figures represent the mean data converted to quartiles.

[2]The Litter Index represents the mean of the quartiles.

TABLE III

ADDITIONAL DESCRIPTIVE VISITOR AREA DATA

	Time Zone	Visitor Days	Water Oriented	Site Type
Cave Creek District				
Bartlett Lake	1 /[1]	94,900/[2]	Yes	B /[3]
Cave Creek	1	3,650	No	D
C.C.C. Camp	1	unknown	No	B
Horseshoe (to Gage Station)	1	14,600	Yes	A
Horseshoe Lake	1	25,550	Yes	D
Horseshoe Lake fishing area	1	unknown	Yes	B
Rattlesnake (Bartlett)	1	unknown	Yes	B
Riverside	1	3,650	Yes	A
Roundtree Canyon	2	unknown	No	A
Seven Springs	1	6,570	Yes	D
Sheep Bridge	2	1,460	Yes	B
Globe District				
C.C.C. Camp	2	unknown	No	B
Jones Water	2	2,190	No	D
Kellner Canyon	2	1,095	No	D
Oak Flats	1	2,920	No	D
Lower Pinal	2	3,980	No	D
Upper Pinal	2	unknown	No	D
Pioneer Pass	2	2,016	No	D
Throwdown "A"	2	unknown	No	A
Throwdown "B"	2	unknown	No	B
Throwdown "C"	2	unknown	No	B
Warnica Springs	2	260	No	D
Mesa District				
Acacia	1	41,844	Yes	C
Blue Point	1	74,529	Yes	B
Boulder Creek	1	5,642	Yes	C
Bulldog	1	58,884	No	B
Butcher Jones	1	10,920	Yes	C
Coons Bluff	1	31,072	Yes	B
Dry Camp	1	22,119	No	A
First Water	1	6,322	No	A
Granite Reef	1	10,950	Yes	D
Laguna	1	24,462	Yes	B
Palo Verde	1	5,840	Yes	C
Peralta	1	7,300	No	B
Phon D. Sutton	1	80,613	Yes	D
The Point	1	2,898	Yes	B
Polly Varden	1	1,562	Yes	A
Port of Phoenix	1	unknown	Yes	B

	Time Zone	Visitor Days	Water Oriented	Site Type
Saguaro Del Norte	1	60,529	Yes	C
Sugarloaf	1	4,259	Yes	A
Tejanos Springs	1	728	Yes	A
Tortilla	1	31,601	No	D
#1 Unassigned	1	2,606	Yes	B
Payson District				
Bear Flat	2	4,216	Yes	B
Christopher Creek	2	28,700	Yes	D
Upper Christopher Creek	2	496	Yes	B
Flowing Springs	2	6,944	Yes	B
Holder Grave	2	496	No	B
Houston Mesa	2	12,400	Yes	B
Pine	2	5,700	No	D
Ponderosa	2	17,300	No	D
Sharp Creek	2	248	Yes	B
Sycamore	2	6,400	Yes	D
Lower Tonto Creek	2	39,100	Yes	D
Upper Tonto Creek	2	1,488	Yes	B
Verde Crossing	2	8,928	Yes	B
Pleasant Valley District				
Airplane Flat	3	unknown	No	B
Bottle Springs	3	992	No	B
Broadtree Saddle	3	214	No	B
Canyon Creek	3	4,066	No	B
Ellenwood Crossing	3	428	No	B
Fisherman's Point	3	200	No	B
Haigler Creek	3	3,210	Yes	D
McFadden Peak	3	214	No	B
Naeglin Canyon	3	992	Yes	A
Ramer Corral	3	124	No	B
Reynolds Creek	3	214	No	B
Rose Creek	3	1,284	No	D
Lower Valentine Canyon	3	unknown	Yes	B
Workman's Creek	3	2,140	Yes	B
Roosevelt District				
"A" Roosevelt	2	unknown	No	B
Anglers Inn	2	800	Yes	B
Apache Lake	2	8,000	Yes	D
Bachelor's Cove	2	7,300	Yes	B
Burnt Corral	2	31,900	Yes	D
Carson's Landing	2	4,745	Yes	B
Cholla Bay	2	10,400	Yes	B
Cottonwoods	2	1,460	Yes	B
Grapevine	2	1,000	No	B
Horse Pasture	2	12,300	Yes	B

	Time Zone	Visitor Days	Water Oriented	Site Type
Hotel Point	2	10,400	No	C
Inspiration Point	2	900	No	C
Mile Wash	2	730	Yes	A
Mills Canyon	2	1,460	Yes	A
Pigeon Springs	2	132	No	D
Porter Springs	2	900	Yes	B
Salt River	2	unknown	Yes	B
Schoolhouse Point	2	800	Yes	B
Windy Hall	2	12,410	Yes	B
Tonto Basin District				
Camp Reno	2	9,123	No	B
North Roosevelt	2	21,721	Yes	B
Sheep Driveway	2	730	Yes	A
Tonto Creek Box	2	730	Yes	A

[1]Zone 1 = less than 1.5 hours from Phoenix, Zone 2 = 1.5 to 3.0 hours from Phoenix, Zone 3 = more than 3.0 hours from Phoenix.

[2]Source: Recreational Inventory Management, U. S. Forest Service, 1970.

[3]Type A = Camping and Picnicking with no facilities. Type B = Camping and picnicking with trash receptacles only, Type C = Picnicking with table and receptacles, Type D = Camping and Picnicking with tables and receptacles.